

**REMARKS**

Applicants respectfully thank Examiner Christopher A. Flory for granting the telephonic Examiner's Interview with Dr. Hugh Herr and applicants' attorneys N. Scott Pierce, and Jean-Paul Cass on October 29, 2007. Applicants express appreciation to the Examiner for the opportunity to discuss the above mentioned patent application, Office Action, outstanding rejections, and claim amendments to advance the prosecution of the instant patent application.

The instant patent application now includes thirty-six (36) pending claims with entry of the instant amendment. Claims 1, 12, 19, 24, 25 and Claim 31 are independent. Claims 2 through 11, and Claims 26 through 28 depend from Claim 1. Claims 13 through 18 depend from independent Claim 12. Claims 20 through 23, and Claims 29, 30 and 32 depend from Claim 19. New Claims 33 through 36 depend from Claim 24.

During the Interview, applicants discussed the claim element of "modulating an impedance of the ankle joint" with the Examiner in view of the rejections under 35 U.S.C. §102(b) and 35 U.S.C. §103(a) in view of United States Patent No. 5,112,296 to Beard *et al.* (hereinafter "Beard *et al.*"). The Examiner's contention was that the term impedance could be interpreted to embrace a resistance of the ankle joint in response to when the foot is lifted in Beard *et al.* by a cable. More particularly, the ankle joint moves from no resistance to full resistance when lifted by the cable. Beard *et al.* does not disclose or suggest modulating stiffness or damping of the ankle joint during walking.

Accordingly, Applicants are amending Claims 1 through 3, 12, 14, 15, 19, 20, 22, 23, 25-28, and 30-32 to remove the claim limitation of impedance. Applicants have replaced the term impedance with "modulating joint stiffness or damping during walking." The claims, as amended, are now patentably distinct over Beard *et al.*

Support for the amendment of Claims 1 through 3, 12, 14, 15, 19, 20, 22, 23, 25-28, and 30-32 can be found at various locations of the Applicants' specification as originally filed including at page 15, lines 4 through 22, and at other locations.

Applicants are also amending Claims 3, 15, and 23 to remove the element "spring-damper positional control." Applicants are replacing the above element with "spring damper control." Support for the amendment of Claims 3, 15, and 23 can be found in the specification as originally filed at, for example, page 15, line 16, and at other locations.

Applicants are also amending Claims 4, 6, 7, 8, 9, 10, and 11 to correct the antecedent basis of the claim element “an orthosis” to “the orthosis,” as the claim currently lacks proper antecedent basis under 35 U.S.C. § 112.

Applicants are amending Claim 25 to recite that the actuator modulates joint stiffness or damping of the ankle joint by controlling the spring in at least “two” different modulation phases during walking, from at least “three” different modulation phases during walking. Support for the amendment of Claim 25 can be found in the patent application, as originally filed, at various locations, for example, at page 8, lines 8-27, and at page 5, line 24 through page 7, line 29, and at other locations.

Applicants are also amending the patent application to add new Claims 33-36. Claims 32 through 36 depend from independent Claim 24. Claim 33 recites that the electrical pulses actively modulate ankle stiffness during a stance period, while Claim 34 recites that the electrical pulses actively modulate ankle stiffness of a torsional spring control. Claim 35 recites that during a swing phase electrical pulses actively modulate joint stiffness or damping. Claim 36 recites that the electrical pulses actively modulate joint stiffness or damping of a spring damper control during a swing phase. Support for new Claims 33 through 36 can be found in the patent application as originally filed at various location of the specification, including page 16, lines 3 through 16, and at page 2, line 12 through 17, and other locations.

During the October 29, 2007 Examiner Interview, the rejection of Claim 24 in view of United States Patent No. 5,643,332 to Stein (hereinafter “Stein”), and United States Patent No. 6,507,757 to Swain *et al.* (hereinafter “Swain *et al.*”) were also discussed.

Stein discloses an electrical stimulation device which causes a depolarization of the underlying membrane. The stimulation causes propagation of an impulse along the nerve and contraction of muscle to lift the foot.

Swain discloses an electrical stimulator for attachment to a leg that has electrodes to apply an electrical stimulus in response to sensing foot rise or foot strike to lift the foot, and draw the foot upwards or downwards.

However, neither Stein or Swain disclose or suggest applying electrical pulses to elicit muscle contractions to actively modulate ankle stiffness or damping during walking.

Amendment of Claim 24 to include the limitation of “applying electrical pulses to elicit muscle

contractions to actively modulate ankle stiffness or damping during walking” overcomes the instant rejection of this claim.

The rejection under 35 U.S.C. §102(b) of Claims 1-9, 11-23, 25-29, and 32 in view of United States Patent No. 5,662,693 to Johnson *et al.* (hereinafter “Johnson”) was also discussed. The Applicants and the Examiner discussed relevant portions of Johnson including at FIG. 3B, and at Col. 8, lines 4-14. At FIG. 3B of Johnson, the difference between the torque of two different artificial muscles was discussed in a push-pull arrangement. Johnson discloses that one double-acting push-pull cylinder may be substituted by using a spring as the opposing muscle in a foot plantation movement (*i.e.*, a force provided by the calf muscle).

Regardless of the amount that the spring is stretched or how the position of the spring is changed, the stiffness and the damping of the spring in Johnson is the same, and is not changed. Therefore, Johnson does not disclose modulating stiffness or damping as presently claimed. Claims 1-9, 11-23, 25-29, and 32, as amended, obviate the rejection of these claims over Johnson.

Finally, Claims 1-4, 6-8, 11-23, 25-30, and 32, which are rejected under 35 U.S.C. §102(e) in view of United States Patent No. 6,966,882 to Horst *et al.* (hereinafter “Horst”), were discussed. At Col. 11, lines 20 through 23, Horst discloses energizing or de-energizing the motor to prevent buckling of the knee, and to ensure a smooth and continuous motion by the knee.

Horst does not disclose or suggest modulating stiffness, damping or both of the ankle joint as presently claimed; Horst discloses a brace device which is attached at the knee, not the ankle joint. Horst also does not disclose or suggest a device that modulates a joint stiffness or damping of an ankle joint during walking as presently claimed.

Applicants submit that new Claims 33 through 36 are patentable as these claims depend from an allowable base Claim 24, which recites, “applying electrical pulses to elicit muscle contractions to actively modulate ankle stiffness, or damping, or both during walking.”

**CONCLUSION**

In view of the above amendments and remarks, it is believed that all of the pending Claims (1-36) are in condition for allowance. It is respectfully requested that all of the outstanding rejections be reconsidered and withdrawn, and that the application be passed to issue. If the Examiner feels that a telephone conference would expedite prosecution of this case, the Examiner is invited to call the undersigned.

Respectfully submitted,

HAMILTON, BROOK, SMITH & REYNOLDS, P.C.

By 

N. Scott Pierce

Registration No.: 34,900

Telephone: (978) 341-0036

Facsimile: (978) 341-0136

Concord, MA 01742-9133

Dated: 11/9/07